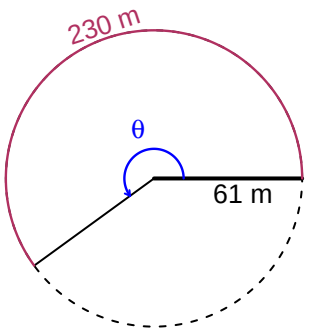
Name: Date:

Trig Final (Solution v12)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 230 meters. The radius is 61 meters. What is the angle measure in radians?

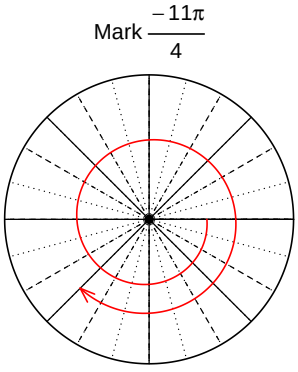


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

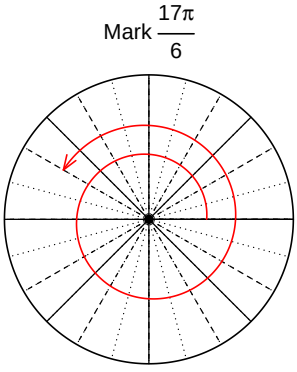
$\theta = 3.77$ radians.

Question 2

Consider angles $\frac{-11\pi}{4}$ and $\frac{17\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-11\pi}{4}\right)$ and $\cos\left(\frac{17\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\sin(-11\pi/4)$



Find $\cos(17\pi/6)$

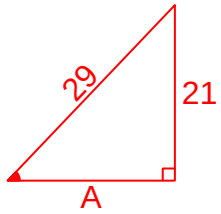
$\sin(-11\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(17\pi/6) = \frac{-\sqrt{3}}{2}$

Question 3

If $\sin(\theta) = \frac{-21}{29}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

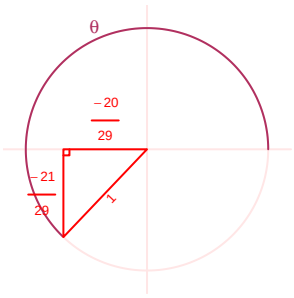
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 21^2 = 29^2$$
$$A = \sqrt{29^2 - 21^2}$$
$$A = 20$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-20}{29}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 4.97 meters, a midline at $y = -2.52$ meters, and a frequency of 6.94 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.97\cos(2\pi 6.94t) - 2.52$$

or

$$y = -4.97\cos(13.88\pi t) - 2.52$$

or

$$y = -4.97\cos(43.61t) - 2.52$$